**Name………………………………………………………. Index No…………………/…….**

**School……………………………………………………… Date ………………………….…**

Candidate’s Signature………………………

121/2

**MATHEMATICS Paper** 2: July 2018

**Time: 2 ½ Hours**

**MOKASA II EXAMINATIONS**

***Kenya Certificate of Secondary Education (K.C.S.E)***

## INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided at the top of this page.

2. This paper consists of two sections: Section I and Section II.

3. Answer ALL questions in section 1 and ONLY FIVE questions from section II

4. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.

5. Marks may be given for correct working even if the answers are wrong.

6. Non – Programmable silent electronic calculators and KNEC mathematical tables may be used, except were stated otherwise

 **FOR EXAMINER’S USE ONLY**

Section I

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | TOTAL16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**GRAND TOTAL**

**Section II**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | TOTAL |
|   |  |  |  |  |  |  |  |  |

***This paper consists of 14 printed pages.***

***Candidates should check the question paper to ensure that all***

***pages are printed as indicated and no questions are missing***

**SECTION 1 (50 MARKS)**

***Answer ALL the questions in this section***

1. Without using a calculator, evaluate (3 marks)

2. The equation of a line $l\_{1}$ is $2x+4y-5=0$. Find the equation of another line $l\_{2}$ perpendicular to $l\_{1}$ and meets it at the *x-*intercept in the form $ax+by=c$. (3marks)

3. The figure below shows triangles ABC and LMN. Show that the two triangles are similar. (1mark)

750

500

5 cm

A

C

B

7.5 cm

2 cm

L

N

M

4 cm

550

750

 Hence find the length of MN and AC (2marks)

4. The length and breadth of a rectangular card were measured to the nearest millimeter and found to be 14.5 cm and 10.6 cm respectively. Find the percentage error in the area. (3 marks)

5. Solve for t in the equation: $6 sin^{2}t-cost-5=0$ for $0^{0}\leq t\leq 360^{0}$ (4 marks)

6. Find x if;  (3 marks)

7. Find the radius and the coordinates of the centre of the circle whose equation

 is $2x^{2}+2y^{2}+12x-20y-4=0$ (3marks)

8. Make t the subject of the formula  (3marks)

9. Solve for $x$ given that $2^{2x+1}=7÷5^{x}$ giving your answer to 4 significant figures. (3 marks)

10. The sum of the first 14 terms of an AP is 595.Given that the sum of the first 8 terms of the same AP is 220; find the first term and the common difference. (3marks)

11. Three quantities P, Q and R are such that P varies as the square of Q and inversely as the cube root of R. If Q is increased by 20% and R is decreased by 48.8%, determine the percentage change in P . (3 marks)

12. In the figure below, PX=8cm, XR=3cm, XT=4cm and TQ=8cm. Use it to answer the questions below:

 

 Find the length of:

1. XS (1 marks)
2. PQ (2 marks)

13. Simplify, giving your answer with a rational denominator$\frac{3}{2+\sqrt{3}}-\frac{2}{\left(2-\sqrt{3}\right)}$ (3 marks)

14. Determine the equation of the tangent to the curve  at the point x = 2. (3 marks)

15. ABCD is a square of side 5cm. A point P moves inside this square so that AP≤PB and

angle APB ≥900. Show by construction, the locus of P. (3 marks)

16. a) Expand and simplify . (2 marks)

 b) Using the first three terms of the expansion to evaluate (1.05)5. (2 marks)

**SECTION II (50 MARKS)**

*Answer any FIVE questions from this section*

17. a) Complete the table below, giving your values to 2 decimal places (2mks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 |
| (2cos x)-1 |  |  | 0 |  | -2 |  | -3 |  | -2 | -1 | 0 |  | 1 |
| Sin x | 0 |  |  | 1 |  | 0.50 | 0 |  |  | -1 |  |  | 0 |

b) Draw the graph of y= (2 co x) – 1 and y=sin x on the grid provided below

 Use the scale 1cm represent 300 horizontal

 2 cm represent 1 unit vertically and 2cm for 1 unit on the y-axis (4 marks)

c) Use the graph to solve:

 i) (2cos x) – 1 = -1.5 (1mark)

ii) 2 cos x – sin x =1 (2marks)

d) State the amplitude of the wave y=2cos x – 1 (1mark)

18. The diagram below show triangle OPQ. OP=p, OQ=q. M divides OP in the ratio 2:3 and N divides OQ in the ratio 3:4. PN and QM meet at E.

P

M

Q

O

Find in terms of p and q

N

1. PN (1mark)
2. QM (1mark)
3. Given that QE=hQM and PE=kPN where h and k are scalars
4. Write down two distinct expressions for OE (2marks)
5. Hence find the values of h and k (4 marks)
6. Express OE in terms of p and q (2 marks)

19. A bag contains blue, green and red pens of the same type in the ratio 8:2:5 respectively. A pen is picked at random without replacement and its colour noted.

 a) Determine the probability that the first pen picked is

 i) Blue (1mark)

 ii) Either green or red. (2marks)

 b) Using a tree diagram, determine the probability that

 i) The first two pens picked are both green (4marks)

 ii) Only one of the first two pens picked is red. (3marks)

20. A and B are two points on the earth’s surface and on latitude 300N.The two points are on the longitude 400W and 1400E respectively.

 Calculate

 (a) (i) The distance from A to B along a parallel of latitude in kilometres. (3marks)

 (ii) The shortest distance from A to B along a great circle in kilometre (4marks)

 (Take =and radius of the earth =6370km)

 (b) If the local time at B is 8.00am, calculate the local time at A (3marks)

21. Lengths of 100 mango leaves from a certain mango tree were measured t the nearest centimeter and recorded as per the table below,

|  |  |  |  |
| --- | --- | --- | --- |
| ***Length in cm***  | ***No. Of leaves*** | ***Cumulative frequency*** | ***Upper limit*** |
| 9.5-12.5 | 3 |  |  |
| 12.5-15.5 | 16 |  |  |
| 15.5-18.5 | 36 |  |  |
| 18.5-21.5 | 31 |  |  |
| 21.5-24.5 | 14 |  |  |

1. Fill in the table above. (2 mark)
2. Draw a cumulative frequency curve from the above data. (4 marks)

b) Use your graph to estimate

 i) The quartile deviation of the leaves (3marks)

 ii) The number of leaves whose lengths lie between 13cm and 17cm. (2marks)

22. The relationship between two variables P and q is given by the equation P = aQn , where a and n are constants. The results on the variation of P and Q are tabulated below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Q | 5 | 10 | 15 | 20 | 25 |
| P | 17.67 | 31.86 | 44.97 | 57.42 | 69.42 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

1. Write down a linear equation connecting P and Q. (1 mark)
2. Complete the table above. (2 marks)
3. Draw a suitable linear graph to verify that the assumed relation is approximately true

(3 marks)

1. Hence determine the values of a and n correct to 2d.p (3 marks)

END

1. State the formula connecting P and Q. (1 mark)

23. a) Use the trapezium rule with 7 ordinates to estimate the area enclosed by the curve $y=\frac{1}{2}x^{2}+3$ and the lines x = 0, x = 6 and the x-axis. (4 marks)

b) Determine the exact area bounded the curve and the lines in section a) above (3 marks)

c) Calculate the percentage error from the trapezoidal rule (3 marks)

24. A manufacturer sells two types of books X and Y. Book X requires 3 rolls of paper while Book Y requires 21/2 rolls of paper. The manufacturer uses not more than 600 rolls of paper daily in making both books. He must make not more than 100 books of type X and not less than 80 of type Y each day

1. Write down four inequalities from this information (4marks)
2. On the grid provided, draw a graph to show inequalities in (a) above (3marks)
3. If the manufacturer makes a profit of sh 80 on book X and a profit of sh 60 on book Y, how many books of each type must it make in order to maximize the profit. (3marks)